

## LITERATURE CITED

- BALOGH, J. 1965. A synopsis of the world oribatid (Acari) genera. *Acta Zool.*, 11 (1-2): 5-99.
- MICHAEL, A. D. 1887. *British Oribatidae*. Vol. II. Ray Society, London.

---

**New Trichoptera from United States and Mexico**

D. G. DENNING

*Moraga, California*

Since the publication of "Evolution and Classification of the Mountain Caddisflies" by Ross in 1956, there has been a continued interest in the phylogeny and biogeography of the Trichoptera, with most attention given the Rhyacophilidae.

The genitalia of male Rhyacophilinae are so diversified that it is difficult to develop a phylogenetic pattern based only on such a complicated structure. Ross recognized this and stated a better "knowledge of the females and larvae should be of great value." With this in mind, the North American *Rhyacophila* females known to the writer are divided into three groups: 1) *mosana* group; no modifications of fifth or sixth sternites, tenth tergum divided into two lobes, terminal segments of abdomen not telescopic; 2) *vuzana* group; fifth or sixth sternite or both with mesal process, tenth tergum not bilobed, terminal segments of abdomen are telescopic; 3) *coloradensis* group; seventh segment highly developed, tenth tergum not bilobed, eighth, ninth, and tenth segments may be withdrawn into seventh segment. It is probable that further knowledge of *Rhyacophila* females will elucidate the phylogeny of the genus, since they are primarily egg-producing organisms and their aquatic oviposition media have not undergone drastic changes.

Two new species of *Rhyacophila*, one new *Agapetus*, one new *Anagapetus*, two new *Atopsyche*, and two new *Culoptila* have been selected for description. The new *Rhyacophila*, *Agapetus*, and *Atopsyche* shed further light on the phylogeny of the family and especially the *Rhyacophila* female of one of the new species. The new *Culoptila* represent a great extension northward of the known distribution of the genus. Types are in the writer's collection unless otherwise indicated.

**Rhyacophila mosana** Denning, new species

The complex male genitalia present several characters which complicate the correct placement of the species. The absence of tergal straps and similar claspers suggest a relationship to *R. ecosia* Ross. However, the dorsal and ventral projections of the tenth tergite are similar to *R. unimaculata* Denning. However, the female genitalia suggest placement in a separate "group."

MALE.—Length 9 mm. Fore wings fulvous, translucent spots scattered through wing. Head and thorax brown. Antennae, palpi, legs about same color as wings, spurs dark brown, 2-4-4. Genitalia as in Fig. 1. Fifth sternite bears a dark sclerotized truncate process, sixth sternite with a light-colored acute process. Ninth segment annular, no modifications. Tenth tergite projected caudodorsad, from lateral aspect (Fig. 1) somewhat beak-like; from dorsal aspect (Fig. 1A) distal margin bilobed, two parallel ridges produce a median trough extending to apex, resultant mesal surface concave. Ventral portion of tenth tergite semi-sclerotized, rugose; from ventral aspect (Fig. 1B) apical margin emarginate; no tergal straps. Clasper with basal segment long, quadrilateral; apical segment short, narrowed distally, directed caudoventrad; mesal distal-third covered with dense, short, reddish setae. Acdeagus with central portion somewhat flattened, about half length of clasper arms, mesal portion acute; lateral arms slender, fused, dorsodistal surface covered with short, dense, reddish setae, as viewed from ventral aspect (Fig. 1C).

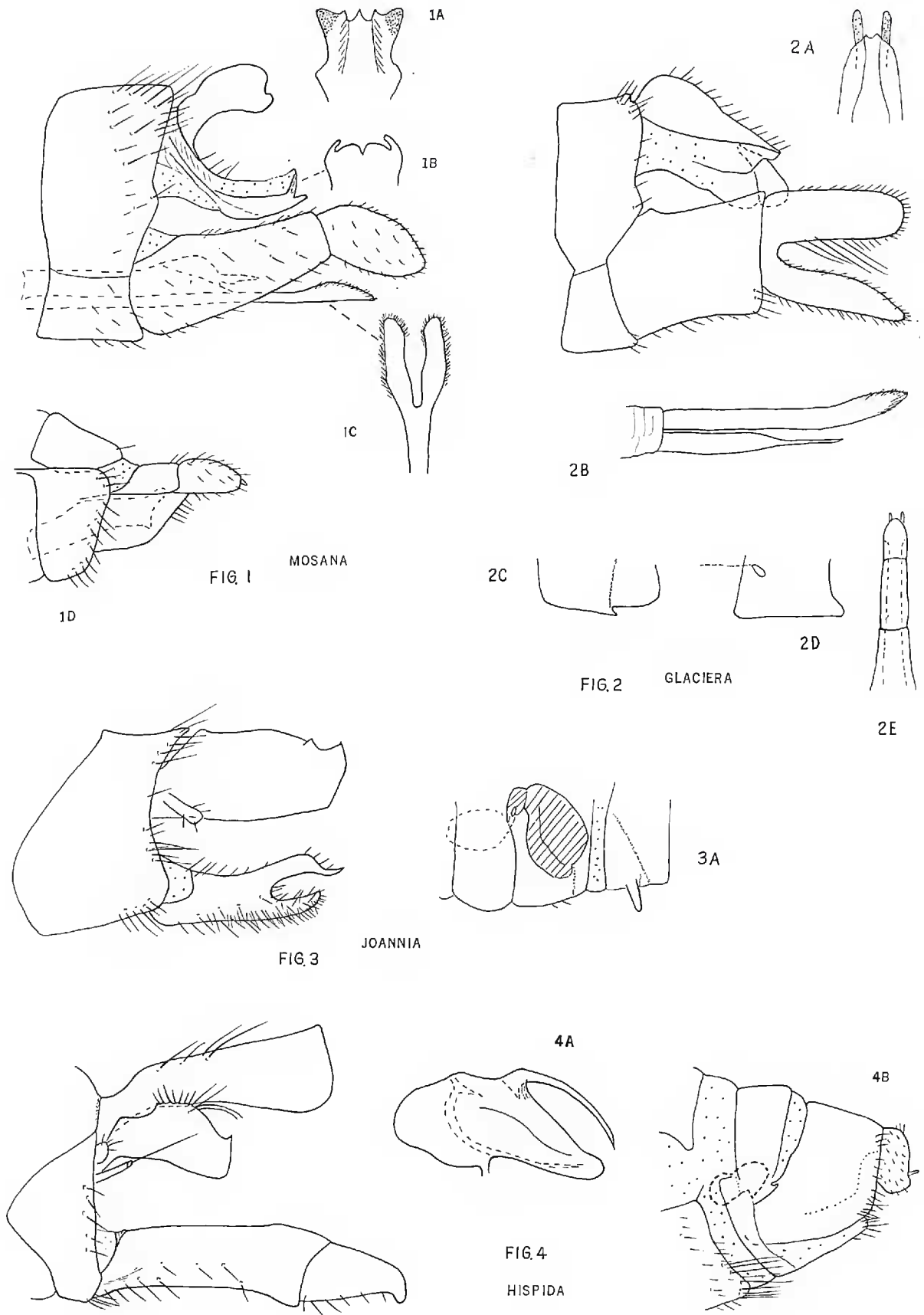
FEMALE.—Length 9 mm. Practically identical to male in general color and characteristics. Fore wings, as in male, with many translucent spots scattered through wing. Genitalia as in Fig. 1D. No modifications of fifth or sixth sternites. Eighth sternal margin bearing a row of long, porrect setae, eighth tergum with no modifications. Ninth tergum simple. Tenth tergite semimembraneous, setiferous, apex bearing a pair of minute tubercles; from dorsal aspect tergum divided into two separated lobes.

*Holotype male*.—CASTLE CRAGS STATE PARK, SHASTA COUNTY, CALIFORNIA, 20 October 1964, D. G. Denning. Allotype female, same data as for holotype. Paratype female, same data as for holotype.

**Rhyacophila glaciera** Denning, new species

This new species is not related to other described species and represents a new "group" in the genus. The bifid claspers, the rotundate-type tenth tergite, and the unfused clasper arms attest to the unspecialized nature of this species. The retractile female terminalia are similar to the vuzana group of *Rhyacophila* females.

MALE.—Length 11 mm. General color of wings light brown, dark markings scattered through fore wings. Head, thorax, antennae, and palpi darker brown. Legs luteus, spurs 3-4-4. Genitalia as in Fig. 2. Ninth segment annular, narrowed at junction of tergum and sternum. Tenth tergite arcuate, tapering ventrad to



## EXPLANATION OF FIGURES

Fig. 1. *Rhyacophila mosana* Denning, male genitalia, lateral aspect; 1A, dorsal portion tenth tergite, dorsal aspect; 1B, ventral portion tenth tergite, ventral aspect; 1C, clasper arms, ventral aspect; 1D, female genitalia, lateral aspect. Fig. 2. *Rhyacophila glaciera* Denning, male genitalia, lateral aspect; 2A, tenth tergite,

a truncate apex; ventral portion semimembraneous, apex divided into two flat platelike sclerites broadly ovate distally, directed ventrad, best viewed from lateral aspect (Fig. 2). Tenth tergite from dorsal aspect (Fig. 2A) narrowed distally, distal margin with narrow emargination, ventral plates widely separated and porrect from this aspect, no tergal straps. Basal segment of clasper short, wide; apical segment divided into a dorsal and ventral lobe, dorsal lobe about same width throughout, apex rounded, ventral lobe narrowed distally, apex subacute; viewed from dorsal aspect upper surface of ventral lobe flattened. Clasper lateral arms separated, slender, from ventral aspect apices divergent, dense mass of reddish setae distally; central body compressed, abruptly narrowed to a long slender apex when seen from lateral aspect (Fig. 2B).

FEMALE.—Length 11 mm. General color of wings, body, appendages, similar to male. Legs yellowish, spurs 3-4-4. Sixth sternum with mesal conical process (Fig. 2C); seventh sternum bears no processes. Eighth sternum extended caudad, the internal apodeme extends cephalad to sixth tergum (Fig. 2D); ninth segment with no modifications. Tenth tergum not bilobed, internal apodeme extends cephalad to sixth segment (Fig. 2E). Ninth and tenth segments are normally withdrawn into eighth.

*Holotype male*.—GLACIER NATIONAL PARK, MONTANA, 13 September 1964, Joe Schuh and W. C. Peters. Allotype female, same data as for holotype. Paratype male and female, same data as for holotype. Mr. Joe Schuh stated the specimens were collected under a bridge at a side-hill waterfall.

### *Agapetus joannia* Denning, new species

This new species is related to *A. marlo* Milne and is an excellent example of parallel development. Although evolved from the same stalk, *A. marlo* is the dominant species and has become quite widely distributed.

MALE.—Length 5 mm. Wings light brown, quite densely covered with dark hair. Head, thorax dark brown. Antennae, palpi, legs fulvous, spurs 2-4-4. Fifth sternite (Fig. 3A) with a large sclerotized concentric organ occupying most of sternum, attached apically is an ovate membraneous sac; external mesal ridge present; sixth sternum with a prominent conical mesal process (Fig. 3A). Genitalia as in Fig. 3. Ninth sternum robust, tergum narrowed, curved caudad. Tenth tergite quadrangular, apex truncate, dorsocaudal corner emarginated, resultant apex bidentate, from dorsal aspect tergite bifurcate, apices flared only slightly

---

←

dorsal aspect; 2B, aedeagus, lateral aspect; 2C, sixth sternum of female; 2D, eighth sternum of female; 2E, eighth, ninth, tenth abdominal segments of female, dorsal aspect. Fig. 3. *Agapetus joannia* Denning, male genitalia lateral aspect; 3A, fifth and sixth sternites of male. Fig. 4. *Atopsyche hispida* Denning, male genitalia, lateral aspect; 4A, aedeagus, lateral aspect; 4B, female genitalia, lateral aspect.

laterad. Cerci digitate, directed ventrolaterad, setae sparse. Clasper slender; apex divided into a ventral subacute, dorsad-curved lobe, and a dorsal attenuated lobe which is curved slightly mesad from ventral aspect. Aedeagus a long slender rod, extending from sixth sternite.

*Holotype male*.—NORTH FORK CACHE CREEK, HWY. 20, LAKE COUNTY, CALIFORNIA, 17 May 1961, M. E. Irwin.

#### AGAPETUS MARLO Milne

This species is confined to California and is fairly abundant. It is quite widely distributed, being known from: Santa Cruz, Santa Clara, San Luis Obispo, Marin, and Tuolumne Counties.

#### *Atopsyche hispida* Denning, new species

This species is related to *A. calopta* Ross. It is selected for description at this time as another example of close parallel development of two species.

**MALE**.—Length 8–9 mm. Wings dark brown, light-colored narrow band near center, translucent spot near apex, wings with considerable dark hair. Thorax, head, appendages varying shades of light brown, spurs yellowish, 2-4-4. Genitalia as in Fig. 4. Mesal ridges present on sternites 3 to 8, sixth sternite with a long, curved, acute mesal spur reaching to seventh sternal spur; seventh sternite with an acute mesal spur extending midway eighth sternite. Paracercus apex truncate, dorsal margin broadly arcuate, bearing considerable dorsad erect setae and two long slender caudoventrad curved setae; distal corner acute. Cercus inconspicuous, bearing a few setae. Filicercus slender, about twice as long as cercus, bearing a long seta. Basal segment of clasper long, slender; apical segment short, narrowed distally, apex curved ventrad, no mesal setose area. Aedeagus lateral lobes tapering to an obtuse semimembraneous apex, inner sclerotized rod present almost to apex; from basal portion arise a pair of bifid darkly sclerotized caudad-curved attenuated rods, reaching ventrad almost to apex (Fig. 4A).

**FEMALE**.—Length 10 mm. Color, general characters similar to male, legs slightly darker, more pilose, spurs 2-4-4. Genitalia as in Fig. 4B. Fifth sternite with a curved mesal ridge, bearing a long acute mesal spur; sixth sternite with a prominent conical spur. Seventh sternum extended caudad, bearing a dense mass of dark setae. Eighth segment narrow, annulate, lightly sclerotized with intersegmental membrane; extending cephalad from ventral part of tergum is a bilobate sclerotized, pouch-like structure, probably of a sensory nature. Tenth tergum semimembraneous, setiferous, bearing a pair of minute tubercles at apex.

*Holotype male*.—FORTIN DE LAS FLORES, VERACRUZ, MEXICO, 23 December 1963, M. J. Tauber and C. A. Toschi. Allotype female, same data as for holotype. Paratype male and female, same data as for holotype. The holotype and allotype will be deposited in the California Academy of Sciences, San Francisco, California.

***Atopsyche schmidi* Denning, new species**

This species is a member of the *batesi* group; it is closely related to *A.alconura* Ross from Peru. Although widely separated geographically, their close parallel development would suggest a much wider distribution of the two species than is known at present.

MALE.—Length 7.5 mm. Fore wings brown, a dark brown spot at junction of  $R_{1+2}$  to margin; a tuft of long, thick, dark brown hair arises from upper surface of hind wing near junction to thorax, a long slender fold is developed in wing membrane to receive this tuft; a tuft of long brown hair arises from metathorax near hind wing. Antennae, palpi, legs fulvous, spurs 2-4-4. Genitalia as in Fig. 5. Third tergite possesses a sensory internal sac with a minute opening to exterior (Fig. 5B); mesal external ridge present. Sixth sternite with a long ventrad-curved spur, seventh sternum with a slender spatulate-type mesal spur. Paracercus elongated, curved dorsad, bifurcated apex results in an acute dorsad directed apex from lateral aspect (Fig. 5); from ventrolateral aspect (Fig. 5A) apex truncate. Cercus flattened, inconspicuous. Filicercus long, slender, slightly capitate. Basal segment clasper long, expanded center portion results in a bowed appearance, apicoventral corner extended slightly ventrad; apical segment narrow, apex truncate and curved mesad, ventral margin bearing a row of ventrad-curved setae; from ventral aspect curved basal segments create a cordate appearance. Aedeagus lateral lobes elongated, obtuse from lateral aspect (Fig. 5); apices widened with a mesal ridge resulting in a subacute apex from ventral aspect (Fig. 5C); internal rod curved slightly dorsad to apex; dorsal external rod bifid at base, curved caudad to an attenuated apex which reaches caudad to apex of lobes.

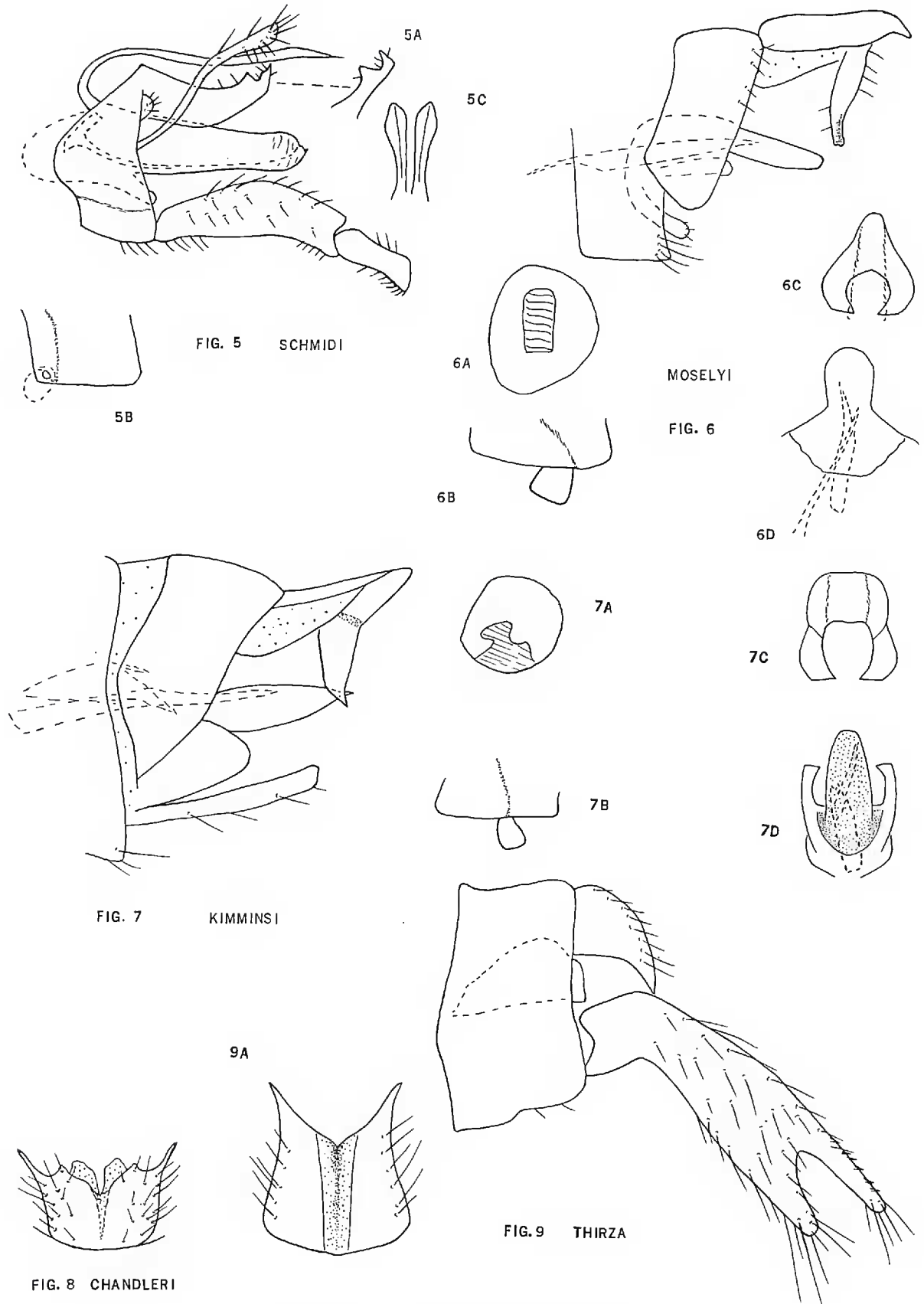
*Holotype male*.—SAN JOSÉ, COSTA RICA, 4 December 1955, Borys Malkin.

It is with pleasure I name this new species in honor of Fernand Schmid, Canada Department of Agriculture, Entomology Research Institute, Ottawa, who has made many outstanding contributions to our knowledge of the Trichoptera.

Genus *CULOPTILA* Mosely

Six years after Martin E. Mosely died in 1948, his paper on "The Protoptila Group of the Glossomatinae" was published by the British Museum. In this paper Mosely erected the genus *Culoptila* to accommodate *C. aluca*, *C. amberia*, *C. rusia*, and *C. saltena* from the south central to southern portion of Mexico.

Salient characters differentiating the genus based on male characters are: development of tegulae to very large structures, all four branches of M present in fore wing, spurs 0-4-4, elongation of the dorsal part of the tenth tergum, and a peculiar mesal process of the sixth sternum. The females are similar in general appearance to the males and also possess a similar mesal process of the sixth sternum.



EXPLANATION OF FIGURES

Fig. 5. *Atopysche schmidi* Denning, male genitalia, lateral aspect; 5A, apex of paracercus, ventrolateral aspect; 5B, third tergite, lateral aspect; 5C, aedeagus, apex, ventral aspect. Fig. 6. *Culoptila moselyi* Denning, male genitalia, lateral aspect; 6A, tegula, ventral aspect; 6B, sixth sternite; 6C, tenth tergite ventral prongs, ventral aspect; 6D, aedeagus cover and aedeagus, dorsal aspect. Fig. 7.

The descriptions of the following two species are the first recording of the genus in the United States. The presence of the genus in Arizona attests to the widespread nature of this little-known genus and the presence of favorable aquatic media in the geological past for widespread distribution.

### *Culoptila moselyi* Denning, new species

**MALE.**—Length 4 mm. General color of wings, body, antennae, and palpi ochraceous, legs yellowish. Tegulae very large, convex, circular, a short cylindrical structure arises from inner surface (Fig. 6A) which is probably a sensory organ since the tegulae are hinged to the thorax. Sixth sternum (Fig. 6B) with a large quadrate mesal process; remainder of sternites with no processes. Genitalia as in Fig. 6. Ninth segment produced dorsocaudad as a dorsal band. Tenth tergum, from lateral aspect, elongated, dorsal portion darkly sclerotized, ventral portion lightly sclerotized, apex subacute and declivent; ventral prongs slender and projected ventrad; from ventral aspect (Fig. 6C) distal margins dark brown, truncate, apices convergent resulting in a circular opening as seen in figure. Aedeagus cover produced caudad as an elongate, slender process when seen from lateral aspect (Fig. 6); from dorsal aspect (Fig. 6D) distal portion narrowed, obtuse, caudal portion wide, triangular, flattened. Aedeagus consists of two appressed dark brown heavily sclerotized structures of unequal length, one is fusiform and stocky, the other slender, acuminate.

**FEMALE.**—Similar in size and general appearance to the male. Fifth sternum bears a sclerotized transverse band, sixth sternum with a flattened, quadrate mesal process, similar to the male but smaller.

*Holotype male.*—GREER, WHITE MOUNTAINS (NEAR SPRINGVILLE), APACHE COUNTY, ARIZONA, 8,000 feet, 7 June 1958, C. P. Alexander. Allotype female, Oak Creek Canyon, Arizona, 16 June 1961, S. G. Jewett. Paratype male, Oak Creek Canyon, Arizona, 22 July 1958, at light, C. W. O'Brien; 1 male, Oak Creek Canyon, Arizona, 16 June 1961, S. G. Jewett. The two paratype males will be deposited in the California Academy of Sciences.

This species is named in honor of the British trichopterist, Martin E. Mosely, Entomology Department, British Museum (Natural History), who died in 1948.

---

←

*Culoptila kimminsi* Denning, male genitalia, lateral aspect; 7A, tegula, ventral aspect; 7B, sixth sternite; 7C, tenth tergite ventral prongs, ventral aspect; 7D, aedeagus cover, clasper, aedeagus, ventral aspect. Fig. 8. *Anagapetus chandleri* Ross, dorsal aspect, tenth tergite of holotype (drawn by H. H. Ross, 1965). Fig. 9. *Anagapetus thirza* Denning, male genitalia, lateral aspect; 9A, tenth tergite, dorsal aspect.



**Culoptila kimminsi** Denning, new species

This, the second species of *Culoptila* to be described from United States, is readily distinguished from *C. moselyi* on the basis of the male genitalia. Unfortunately the specimen is damaged and the head, one pair of wings, and three legs are missing.

MALE.—Length 4 mm. Wings, body, appendages fulvous, spurs 0-4-4. Tegulae very large, oval, convex, concave mesal surface bears an irregular-shaped structure (Fig. 7A). Sixth sternum with a mesal ridge and a broad, flat, ovate mesal process (Fig. 7B). Genitalia as in Fig. 7. Ninth segment produced dorsocaudad as a dorsal band. Tenth tergum elongated, dorsal portion darkly sclerotized, ventral portion lightly sclerotized, apical portion bearing a pair of ventral prongs (Fig. 7); from dorsal or ventral aspect (Fig. 7C) apex of tergum broadly ovate, prongs convergent, apices dark, truncate. Clasper slender, elongated, directed caudad (Fig. 7). Aedeagus cover, lateral aspect, narrowed distally, apex acute; from ventral aspect (Fig. 7D) structure is convex, narrow, apex ovate. Clasper, from ventral aspect (Fig. 7D) narrowed distally, apices truncated and curved slightly mesad. Aedeagus heavily sclerotized, dark brown, appears to consist of two subequal processes, one large and stocky, the other slender and acuminate (Fig. 7D).

*Holotype male*.—GREER, WHITE MOUNTAINS, ARIZONA, 8,000 feet, 7 June 1958, C. P. Alexander.

Named in honor of Mr. D. E. Kimmins, Department of Entomology, British Museum (Natural History), who worked in close cooperation with the great British trichopterist, Mr. Mosely, and who made the original illustrations of this interesting genus.

**Genus ANAGAPETUS** Ross

Five closely related species, all from the western montane region, comprise the genus ANAGAPETUS. Most of the collection records are from the higher mountains and suggest a distribution of a local nature.

**ANAGAPETUS DEBILIS** Ross

The species is recorded from Utah, Colorado, Wyoming, Oregon, and Montana. Additional records are available from several localities in Idaho, Alberta, Washington, and Oregon. It is the widest-distributed member of the genus.

**ANAGAPETUS BERNEA** Ross

Ross has recorded the species from Washington and Oregon. Additional records are available from Tehama, Siskiyou, Modoc, Inyo, and Madera Counties, California. Mr. Joe Schuh, Klamath Falls, Oregon,

has collected the species in abundance from a seepage area near the Klamath River in Klamath County, Oregon.

ANAGAPETUS HOODI Ross

The species was described from specimens collected at Mt. Hood, Oregon. Additional records are available from Baker, Oregon, Crater Lake National Park, Oregon and Mt. Rainier, Washington.

ANAGAPETUS CHANDLERI Ross

The species was described from a pair collected in Mariposa County, California. Additional records are available from Inyo County, California, 7,800 feet, 13 August 1959, C. P. Alexander, and Fresno County, California, Kings Canyon National Park, 21 June 1963, C. P. Alexander.

ANAGAPETUS AISHA Denning

Known only from the type locality, Kings Canyon National Park, California.

**Anagapetus thirza** Denning, new species

This is the sixth species to be described in the genus. This new species is superficially very similar to *A. chandleri* Ross. Major diagnostic differences occur in the tenth tergite. From lateral view the tenth tergite lobes are declivent, tapering to an acute apex while in *A. chandleri* the apex is thumblike. From dorsal aspect tenth tergite lateral lobes of *A. thirza* are considerably longer, narrower, and tapering much more gradually to an acute apex than in *A. chandleri*; also, in *A. thirza* mesal area between lobes is lightly sclerotized while in *A. chandleri* the area is membranous.

Dr. H. H. Ross, Illinois Natural History Survey, compared *A. thirza* to the holotype of *A. chandleri*. For inclusion in this paper, to illustrate the differences between the two species, the dorsal aspect of the tenth tergite was drawn by Ross from the holotype (Fig. 8).

MALE.—Length 5 mm. Head, thorax, and abdomen dark brown, wings and legs uniformly brown, spurs blackish, 2-4-4. Fifth sternite with a lateral elongated triangular protrusion joined to each with a transverse band, sixth sternite unmodified except for a transverse band, seventh sternum bears a short, conical mesal process. Genitalia as in Fig. 9. Ninth segment annulate, narrowed dorsally. Tenth tergite lobe, lateral aspect, sharply declivent, apex acute; from dorsal aspect (Fig. 9A) lateral lobes long and slender, apices acuminate and directed ventrolaterad, scattered setae along dorsal margin; lobes divided by a

deep mesal trench. Claspers elongate, curved ventrad, apical incision creates a slender dorsal and a wide ventral process, apices bear long slender setae; from dorsal aspect, basal portion of clasper appears greatly inflated. Aedeagus discernible through ninth segment, elliptical, simple, apex truncate.

*Holotype male*.—COTTONWOOD CREEK, MONO COUNTY, CALIFORNIA, 9,300 feet, 10 July 1961.

#### LITERATURE CITED

- Ross, H. H. 1951. The caddisfly genus *Anagapetus*. *Pan-Pac. Entomol.*, 27: 140-144.
1956. Evolution and classification of the mountain caddisflies. The University of Illinois Press, Urbana, 213 p.
- MOSELY, M. E. 1954. The Protoptila Group of the Glossosomatinae (Trichoptera: Rhyacophilidae). *Bulletin of the British Museum (Natural History)* London, 3 (9): 317-346.

---

### Three New Species of the Genus *Anomiopsyllus*

(Siphonaptera : Hystrichopsyllidae)

ALLAN M. BARNES

*State Department of Public Health, Berkeley, California*

The genus *Anomiopsyllus* is composed of small, eyeless, nest-dwelling fleas parasitic on wood rats in western North America. As reviewed recently by Hopkins and Rothschild (1962), the genus contains seven species whose known distributions lie entirely within the nearctic region from near Banff, Alberta, Canada to the approximate latitude of Mexico City, Mexico. In the course of more extensive taxonomic and biological studies on the group (Barnes, 1963), three new species have come to light, one of which extends the known range of the genus to the edge of the neotropical region in southwestern Mexico. The present paper presents descriptions of these new species with brief notes on distribution and host occurrence.

#### *Anomiopsyllus walkeri* Barnes, new species

(Fig. 1)

This species is most closely related to *A. nudatus*, but is readily distinguishable in males by the presence of three rather than two spiniform setae in the subapical vertical row along the posterior margin of the clasper, and by the configuration of the dorsal margin of the aedeagus